

22 00 00 Plumbing:**General:**

1. The city water pressure is approximately 450 kPa (65 psig). City water temperatures vary from a low of 10C (35F) in mid-winter to a high of 25C (77F) in late summer.
2. The minimum water service connection size is 6" diameter.
3. Water service connections shall be designed to prevent breakage due to settlement and frost heaving. This may be accomplished either by a firm support or a flexible pipe connection.
4. All water service connections must include premise backflow protection. Two full size backflow preventors must be installed in parallel to ensure no interruption in water service during annual testing.
5. The pressure in the gas utility main is approximately 1.5 kPa (6" W.G.).
6. The Central Heating Plant generates steam at 1860 kPa (270 psig). It is reduced to 830 kPa (120 psig) for the East Campus line and 380 kPa (55 psig) for the Central Campus line. Equipment within buildings should be designed for a steam pressure of 150 psig.
7. The steam supply to a building will normally be provided by a steam line from a manhole just outside the building.
8. Steam lines entering buildings must be provided with double block and bleed valves.
9. No mechanical services are to run through electrical rooms unless specifically serving the electrical room.
10. Storm or sewer lines from other buildings or from exterior catch basins are not to run into, or under another building.

Mechanical Identification:

1. Identification of Piping Systems
2. Piping contents shall be classified by colour and identified by name. Colour markings shall be applied on the piping by using paint, plastic bands or full circumference tape made to conform to the standards. Legends shall be applied on the piping with paint or plastic bands. Arrows shall be used to indicate the direction of flow. Decals shall not be used. Classification colours for common piping contents shall comply with the table below "Identification of Piping Systems."

IDENTIFICATION OF PIPING SYSTEMS		
SERVICE	COLOUR	CLASS
Brine	Green	Safe
Chilled Water Return	Green	Safe
Chilled Water Supply	Green	Safe
Condenser Water Return	Green	Safe
Condenser Water Supply	Green	Safe
Controls Compressed Air	Green	Safe
Cooling Tower Water Return	Green	Safe
Cooling Tower Water Supply	Green	Safe
Deionized Water	Green	Safe
Domestic Cold Water	Green	Safe
Nitrogen	Green	Safe
Lab Compressed Air	Green	Safe
Plumbing Vent	Green	Safe
Sanitary Drain	Green	Safe
Storm Drain	Green	Safe
Ammonia	Yellow	Dangerous
Condensate	Yellow	Dangerous
Condensate Vent	Yellow	Dangerous
Domestic Hot Water Supply	Yellow	Dangerous
Domestic Hot Water Return	Yellow	Dangerous
Fuel Oil	Yellow	Dangerous
Glycol Yellow Dangerous	Yellow	Dangerous
Hot Water Heating Supply	Yellow	Dangerous
Hot Water Heating Return	Yellow	Dangerous
Lab Vacuum	Yellow	Dangerous
Natural Gas	Yellow	Dangerous
Pumped Condensate	Yellow	Dangerous
Refrigerant – Liquid	Yellow	Dangerous
Refrigerant – Suction	Yellow	Dangerous
Steam	Yellow	Dangerous
Halon – Fire Protection	Red	Fire Protection
Sprinkler Water Red	Red	Fire Protection

3. Identification of Concealed Mechanical Equipment. Provide round adhesive labels on ceiling T-bars and access doors to identify concealed valves, air terminal units, fire dampers, or similar concealed mechanical equipment. The diameter of the label is to match the width of the T-bar or be 1" for access doors. Use permanent black ink with the following colors for specified labels:
 - a. Fire-protection devices, including dampers: Red Label
 - b. Air-handling terminal devices: Orange Label
 - c. Isolation, balancing and control valves: Green Label
 - d. Label shall follow the layout shown in Figure 1 and be oriented to indicate the equipment location. The tag number shall match the as-built drawings.

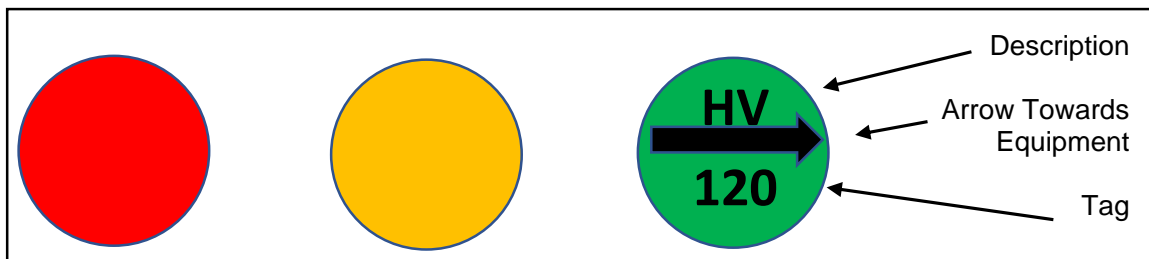


Figure 1

Mechanical Insulation:

1. Thermal and acoustic insulation media shall not contain asbestos.
2. Thermal and acoustic insulation adhesives shall not contain starch.
3. Equipment data/name plates shall not be covered with insulation.
4. Thermal Insulation for Piping:
 - a. Valves, pressure regulating valves (PRV), strainers, expansion joints and equipment that must remain accessible for servicing shall be insulated with reusable insulating blankets.
 - b. Insulate pipe, fittings, valves and strainers carrying: rainwater, steam, gravity condensate, pumped condensate, cooling tower piping inside and outside of building, city water, domestic cold water, domestic hot water, domestic hot water recirculation, cold water meter assemblies and fire protection headers. Insulation jackets for exposed piping should be either PVC or aluminum. Jackets for steam piping shall not be PVC.
5. Thermal Insulation for Ducting:
 - a. Externally insulate fresh air ducts, conditioned supply ducts, sheet metal fresh air plenums, mixed air plenums, silencers and blankoffs behind unused sections of louvers.
 - b. Provide appropriate vapour barrier on the warm side of all systems where that temperature can be less than the dew point temperature of the surrounding environment, such as ducting, chilled water pipes, domestic cold water pipes.
6. Thermal Insulation for Equipment.

- a. Use reusable blankets to insulate heating convectors, domestic water heaters, condensate receivers and heat exchangers (shell and tube, plate and frame.), and backflow preventers.

Facility Sanitary Sewage:

1. Sanitary, storm, and circulating pumps shall be duplex type, dual lobe and equipped with automatic pump change over controls. Sanitary pumps should be grinders.
2. All 0.5 HP and larger sanitary, storm, and circulating pumps shall be provided with auxiliary contacts for monitoring of run times by the QUEMS.
3. Sanitary and storm sumps shall be provided with high water alarms monitored by the QUEMS and connected to Emergency Report Centre (ERC).
4. All 0.5 HP and larger sanitary (sewage) and storm (sump) pumps shall be 220 V.
5. Armstrong, Xylem and Bell and Gossett are preferred manufacturers of sanitary and storm pumps.
6. Sanitary and storm pumps shall be on emergency power.
7. Booster pumps shall be duplex type with a full-size bypass.
8. Piping should be located so as not to require heat tracing. If heat trace is used, ensure that it is labelled.
9. All sanitary and storm lines above grade shall drain to sewer by gravity. Only lines on floors below grade shall be permitted to be pumped to the sewer.
10. Combined trapping or gang trapping will only be allowed with special permission from Facilities Plumbers and Facilities Mechanical Engineers. Combined trapping should not be used for washrooms and kitchens.
11. Fume hoods shall be separately trapped and vented.
12. Trap primers shall be valved on the pressure side of the primer. Individual or manifold trap primers may be used. For manifold trap primers, the associated traps should be identified on a list and attached to the manifold.
13. Access doors, 300 mm x 300 mm (12" x 12") minimum, shall be provided to service traps.
14. Soil waste and vent lines larger than 76 mm (3") shall be cast iron. Lines three inches and smaller shall be type DWV copper tubing and fittings shall be wrought copper with soldered connections. In laboratories plastic may be used from sinks to stacks.
15. In new buildings that are to use steam all underground sanitary piping should be cast iron. Plastic may be used if cast iron will not provide acceptable resistance to chemicals. In repairs to existing buildings that use steam plastic shall not be used to repair non-plastic sanitary or storm drains.
16. Rainwater leaders shall be cast iron.
17. All drainage clean-outs shall be accessible and shall be of the plate, gasket and bolt type.
18. In general sump or sewage pump discharge lines shall be threaded or welded.
19. Grooved pipe joining methods may only be used within mechanical rooms.
20. Grease interceptors to be concrete, stainless steel, FRP, or plastic. They are to be located outdoors.

Facility Water Distribution:

1. Dielectric couplings shall be used when pipes or equipment of dissimilar metals are joined.
2. Piping should be located so as not to require heat tracing.
3. Where possible, pipe expansion should be accommodated with "U" bends or braided flexible connectors rather than mechanical expansion compensators.
4. Hot, cold, and recirculating water above ground piping shall be Type L hard tempered copper tubing, and fittings shall be wrought copper. For sizes larger than 76mm (3"), ductile iron pipe, stainless steel, or Victaulic copper may be used.
5. Pure water piping shall not be glass.
6. All soldered joints shall be made with lead-free solder.
7. Lead inserts shall not be used between hangers and copper pipe. The hangers should be copper, or epoxy coated, or copper coated. Black steel hangers should not be used to prevent dissimilar metals from interacting.
8. Sleeves must be 1" above the floor and sealed to prevent water seeping to the floor below.
9. Domestic Water Conditioning
 - a. Where purified water is required, it shall be provided by reverse osmosis and appropriate filters. Stills shall not be used.
 - b. Ensure that purified water faucets will provide adequate flow from the small static head available.
 - c. Purified water piping shall not be glass. Plastic piping is preferred.
10. Backflow Preventors
 - a. RP backflow preventors, where required, shall include a relief valve monitoring switch to be monitored by Queen's ERC system and may only be installed in mechanical rooms.
 - b. All backflow preventors to include an upstream strainer.
 - c. Premise backflow preventors and backflow preventors impacting critical equipment shall be installed in parallel, full-size pairs.

Domestic Water Heaters:

1. Domestic Hot water tanks are to be set at a minimum of 140 degrees F.
2. Domestic Hot water system to include a thermostatic mixing valve for distribution to occupants.
3. Except for point of use hot water tanks, duplex circulating pumps to be included.
4. Dielectric couplings shall be used when connecting copper pipe to steel tanks.
5. Storage tanks are to be used to minimize peak demand loads on the system.
6. To reduce the rate of scale build-up, tube bundles for steam to hot water converters shall not be helically wound. Tube bundles to be stainless steel.

Commercial Plumbing Fixtures:

Water Closets:

1. Public water closets shall have flush valves.
2. Private water closets may have flush tanks or flush valves.
3. Office: wall hung closets are acceptable, however, they should have top spuds and heavy duty wall hangers.
4. Water closets shall be of vitreous china.
5. Flush tanks to include tank liner.
6. Flush volume to be meet OBC and/or LEED requirements. No additional water reduction above minimum requirements are the be sought.
7. Tank type toilets to be American Standard Cadet Pro or approved equal.
8. Pressure assist tank toilets are not permitted.
9. Automatic flush valves; new construction to include hardwired automatic flush valves. Retrofit projects to include, if feasible hardwired automatic flush valves, or solar powered automatic flush valves. Flush valves to be exposed hardware.
10. Seats to be white, solid plastic, less cover, stainless steel hardware with check hinges.
11. Floor mounted rear exit toilets are not permitted.

Urinals:

1. Flush tanks are not permitted on urinals.
2. Urinals to have automatic flush valves. New construction to include hardwired automatic flush valves. Retrofit projects to include solar powered automatic flush valves.
3. Flush volume to be meet OBC and/or LEED requirements. No additional water reduction maximum flow requirements are the be sought.
4. Urinals shall be of vitreous china with extended shields, integral trap, and removable stainless steel strainer.
5. Waterless urinals are not permitted.

Washroom Lavatories:

1. Vitreous china with splash lip and front overflow.
2. Faucet to include aerator with maximum 3.8 litres per minute.
3. Automatic sensing faucets: new construction to be hardwired automatic sensing faucets.

Service Sinks:

1. Sinks to be acid-resisting porcelain enameled cast iron with roll rim and stainless steel rim guard.
2. Supply fitting shall have vacuum breaker, heavy cast brass spout with pail hook and brace to wall.
3. A dedicated cold water tap with vacuum breaker shall be installed for use with cleaning chemical dispenser.

Commercial Bathtubs:

1. Stain-resisting, acid resisting, one-piece, porcelain enameled steel, glossy white finish, with non-slip surface, integral wide rim seat, sound insulating package.
2. Waste: concealed pop-up waste and overflow fitting with lever-operated mechanism.

Commercial Showers:

1. Shower head: MOEN model 5263EP15 – 5.7 litres per minute max, or approved equivalent.
2. Control valve to be pressure balancing.